CLAIMS

1. A planar-magnetic transducer comprising:

at least one thin film vibratable diaphragm with a first surface side and a second surface side, including a predetermined active region, said predetermined active region including a predetermined conductive surface area for converting an input electrical signal into a corresponding acoustic output;

primary magnetic structure including at least three elongated magnets placed adjacent and substantially parallel to each other with said magnets being of high energy and each having an energy product of greater than 25 mega Gauss Oersteds which results in strong interaction between adjacent magnets; and

a mounting support structure coupled to the primary magnetic structure and the diaphragm to capture the diaphragm, hold it in a predetermined state of tension and space it at predetermined distancing from the primary magnetic structure adjacent one of the surface sides of the diaphragm; said conductive surface area including elongate conductive paths running substantially parallel to said magnets;

the mounting support structure, the at least three magnets of the primary magnetic structure, and the diaphragm having coordinated compositions and being cooperatively configured and positioned in predetermined spaced apart relationships wherein (i) the mounting support structure stabilizes the diaphragm in a static configuration at the predetermined tension which remains stable over and between extended periods of use, despite occurrence of dynamic conditions in response to extreme high energy forces driving the diaphragm to audio output, and (ii) the high energy magnetic forces interacting between the at least three magnets do not interfere with the predetermined tension of the diaphragm;

said planar-magnetic transducer being operable as a single-ended planar-magnetic transducer.

2. A planar-magnetic transducer as set forth in claim 1 wherein the high energy magnets comprise neodymium.

3. A planar-magnetic transducer as set forth in claim 1 wherein the high energy magnets are neodymium magnets with an energy rating of at least 34 mGO.

4. A planar-magnetic transducer as set forth in claim 1, wherein the at least one thin film vibratable diaphragm includes a predetermined active region of less than 150 square inches, said predetermined active region including a predetermined conductive surface area for converting the input electrical signal into the corresponding acoustic output having an upper audio bandwidth extending down to a low range audio frequency.

5. A planar-magnetic transducer as set forth in claim 4 wherein said transducer diaphragm has a vibratable area and a fundamental resonant frequency representing approximately the lowest potential cutoff frequency of operation,

the vibratable area and lowest cutoff frequency of operation of the planar-magnetic transducer falling into the unique range of

$Fr < (2000/\sqrt{A})$

wherein (Fr) equals the fundamental resonant frequency of the transducer in Hertz and (A) equals the vibratable area of the transducer diaphragm in square inches.

6. A planar-magnetic transducer as set forth in claim 4 wherein:

said transducer diaphragm has a vibratable area and a centered gap between the magnetic structure and the diaphragm measured at the center of the diaphragm,

said transducer has a fundamental resonant frequency representing approximately the lowest potential cutoff frequency of operation, and

the vibratable area and lowest cutoff frequency of operation of the planar-magnetic transducer are in the range of

$Fr < (1500/\sqrt{A}\ G)$

wherein (Fr) equals the fundamental resonant frequency of the transducer in Hertz and (A) equals the vibratable area of the transducer diaphragm in square inches and (G) equals the magnet to diaphragm gap measured in millimeters at the center of the transducer diaphragm.

7. A planar-magnetic transducer as set forth in claim 4 wherein:

said transducer diaphragm has a vibratable area and a centered gap between the magnetic structure and the diaphragm measured at the center of the diaphragm,

said transducer has a fundamental resonant frequency representing approximately the lowest potential cutoff frequency of operation, and

the vibratable area and lowest cutoff frequency of operation of the planar-magnetic transducer are in the range of

$Fr < (1000/\sqrt{A}\ G)$

wherein (Fr) equals the fundamental resonant frequency of the transducer in Hertz and (A) equals the vibratable area of the transducer diaphragm in square inches and (G) equals the magnet to diaphragm gap measured in millimeters at the center of the transducer diaphragm.

8. A planar-magnetic transducer as set forth in claim 4 wherein:

said transducer diaphragm has a vibratable area with a length and a width dimension wherein the width dimension is the lessor of the length and width dimensions,

said transducer has a fundamental resonant frequency representing approximately the lowest potential cutoff frequency of operation, and

the width of the vibratable area and lowest cutoff frequency of operation of the planar-magnetic transducer are in the range of

$Fr < (1000/W)$

wherein (Fr) equals the fundamental resonant frequency of the transducer in Hertz and (W) equals width dimension of the vibratable area of the transducer diaphragm in inches.

9. A planar-magnetic transducer as set forth in claim 4 wherein:

said transducer diaphragm has a vibratable area with a width dimension less than a length dimension,

the transducer further has a gap dimension between the magnetic structure and the diaphragm and said gap dimension measured at the center of the diaphragm,

said transducer has a fundamental resonant frequency representing approximately the lowest potential cutoff frequency of operation, and

the width of the vibratable area and lowest cutoff frequency of operation of the planar-magnetic transducer are in the range of

$Fr < (800/W)/G$

wherein (Fr) equals the fundamental resonant frequency of the transducer in Hertz and (W) equals width dimension of the vibratable area of the transducer diaphragm in inches and (G) equals the magnet to diaphragm gap measured in millimeters at the center of the transducer diaphragm.

10. A planar-magnetic transducer as set forth in claim 4 wherein the predetermined active diaphragm region has a total surface area of less than 100 square inches.

11. A planar-magnetic transducer as set forth in claim 4 wherein the predetermined active diaphragm region has a total surface area of less than 80 square inches.

12. A planar-magnetic transducer as set forth in claim 4 wherein the predetermined active diaphragm region has a total surface area of less than 60 square inches while having an operating resonant frequency of less than 400 Hz.

13. A planar-magnetic transducer as set forth in claim 12 having an operating resonant frequency of less than 300 Hz.

14. A planar-magnetic transducer as set forth in claim 4 wherein the predetermined active diaphragm region has a total surface area of less than 20 square inches while having an operating resonant frequency of less than 400 Hz.

15. A planar-magnetic transducer as set forth in claim 14 having an operating resonant frequency of less than 300 Hz.

16. A planar-magnetic transducer as set forth in claim 4 wherein the predetermined active diaphragm region has a total surface area of less than 9 square inches while having an operating resonant frequency of less than 900 Hz.

17. A planar-magnetic transducer as set forth in claim 4 further comprising a plurality of said transducers intercoupled as a line source of serially mounted transducers which form a loudspeaker taller than one transducer.

18. A planar-magnetic transducer as set forth in claim 1 further comprising at least one spacer structure positioned and abutting between at least two adjacent high energy magnets to eliminate the effect of magnetic attraction forces from potentially reducing the predetermined distance between at least two of the high energy magnets so the high energy magnetic forces do not interfere with the predetermined tension of the diaphragm.

19. A planar-magnetic transducer as set forth in claim 1 wherein the predetermined distance between at least two of the adjacent high energy magnets is at least seventy five thousandths of an inch.

20. A planar-magnetic transducer as set forth in claim 1 wherein the predetermined distance between at least two of the adjacent high energy magnets is at least ninety thousandths of an inch.

21. A planar-magnetic transducer as set forth in claim 1 wherein the predetermined distance between at least two of the adjacent high energy magnets is at least one hundred and fifty thousandths of an inch.

22. A planar-magnetic transducer as set forth in claim 1 wherein at least two of the adjacent high energy magnets have common dimensions and the predetermined distance therebetween is at least one half the width of one of the magnets.

23. A planar-magnetic transducer as set forth in claim 1, wherein the predetermined distance between the at least two high energy magnets is at least seventy percent of the width of one of the at least two adjacent magnets.

24. A planar-magnetic transducer as set forth in claim 1, wherein the predetermined distance between at least two of the adjacent high energy magnets is at least 100 percent of the width of one of the at least two adjacent magnets.

25. A planar-magnetic transducer as set forth in claim 1, wherein the mounting support structure further includes forward support structure coupled to the mounting support structure and extending across and forward of the diaphragm to eliminate the effect of combined diaphragm tension forces and magnetic attraction forces from potentially reducing the predetermined distance between the adjacent magnets.

26. A planar-magnetic transducer as set forth in claim 1 further comprising:

a rigid covering structure attached to the mounting support structure and having open areas and closed areas which substantially cover one of said first or second surface sides of the diaphragm,

the primary magnetic structure being attached to the mounting support structure and mounted over the first surface side of the diaphragm,

said covering structure open areas having acoustic transparency.

27. A planar-magnetic transducer as set forth in claim 27 wherein said rigid covering structure is ferrous composition and provides magnetic shielding.

28. A planar-magnetic transducer as set forth in claim 27 wherein said rigid covering structure braces the transducer against support structure flexing and very high magnetic forces caused by the adjacently mounted high energy magnets and supports the maintenance of predetermined diaphragm tension calibration.

29. A planar-magnetic transducer as set forth in claim 1 wherein a long term viscous material is applied along at least a portion of a periphery of the vibratable diaphragm and configured to provide damping properties to the diaphragm.

30. A planar-magnetic transducer as set forth in claim 30 wherein application of said viscous material is limited to an area outside of the conductive surface area but extends into the active region of the diaphragm.

31. A planar-magnetic transducer as set forth in claim 30 wherein application of said viscous material is limited to an area of the diaphragm outside and proximate to a last row of magnets on each side of the primary magnetic structure but extends into the active region of the diaphragm.

32. A planar-magnetic transducer as set forth in claim 31, wherein said viscous material is a solvent based polyurethane compound.

33. A planar-magnetic transducer as set forth in claim 1 wherein:

said diaphragm has a central region and lateral regions that are a distance away from said central region,

said primary magnetic structure has central region magnets and lateral magnets that are spaced away from said central region magnets,

the predetermined spaced-apart relationship of the diaphragm from the magnets of the primary magnetic structure being greater at the central region of the diaphragm which is positioned over at least one central magnet than at the lateral diaphragm regions which are positioned over at least one lateral magnet.

34. A planar-magnetic transducer as set forth in claim 1 wherein at least a first of the transducers is optimized for higher frequencies and attached to at least a second of the transducers which is optimized to operate down to a lower frequency than that of said first transducer thereby forming a multiway

loudspeaker, said multiway loudspeaker further including at least a high pass crossover filter for driving said first transducer.

35. A planar-magnetic transducer comprising:

at least one thin film vibratable diaphragm with a first surface side and a second surface side, including a predetermined active region, said predetermined active region including a predetermined conductive surface area for converting an input electrical signal into a corresponding acoustic output;

a magnetic structure including at least three elongated magnet rows placed adjacent and substantially parallel to each other with said magnets each being of high energy product greater than 25 mega Gauss Oersteds; and

a mounting support structure coupled to the primary magnetic structure and the diaphragm to capture the diaphragm, hold it in a predetermined state of tension and space it at predetermined distancing from the primary magnetic structure adjacent one of the surface sides of the film diaphragm;

said conductive surface area including elongate conductive paths running substantially in parallel with said magnets;

the mounting support structure, the diaphragm and the at least three magnets of the primary magnetic structure having coordinated compositions and being cooperatively configured and positioned in predetermined spaced apart relationships wherein (i) the mounting support structure stabilizes the static and dynamic relationship between the diaphragm and the primary magnetic structure over and between extended periods of use and (ii) concurrently resists the high energy magnetic forces interacting between the at least three magnets which would otherwise interfere with the predetermined tension of the diaphragm;

said planar-magnetic transducer being operable as a single-ended planar-magnetic transducer.

36. A planar-magnetic transducer as set forth in claim 35 wherein the high energy magnets comprise neodymium.

37. A planar-magnetic transducer as set forth in claim 35 wherein the high energy magnets are neodymium magnets with an energy rating of at least 34 mGO.

38. A planar-magnetic transducer comprising:

at least one thin film vibratable diaphragm with a first surface side and a second surface side, including a predetermined active region, said predetermined active region including a predetermined conductive surface area for converting an input electrical signal into a corresponding acoustic output;

a mounting support structure coupled to the primary magnetic structure and the diaphragm to capture the diaphragm, hold it in a predetermined state of tension and space it at predetermined distancing from the primary magnetic structure adjacent one of the surface sides of the film diaphragm; and

primary magnetic structure including at least three high energy, elongated magnets placed adjacent and substantially parallel to each other with each magnet having an energy product of greater than 25 mega Gauss Oersteds;

said conductive surface area including elongate conductive paths running substantially in parallel with said magnets;

the mounting support structure, the diaphragm and the at least three magnets of the primary magnetic structure being cooperatively configured and positioned in predetermined spaced apart relationships;

at least two of said high energy magnets being adjacently positioned in a predetermined spaced apart relationship wherein adjacent poles of the adjacent magnets have nonshared, localized magnetic loops represented by local loop energy maxima in a plane of the diaphragm which are respectively greater than a shared energy maxima at a central position between the adjacent poles and extending along a shared magnetic loop of the respective adjacent poles in the plane of the diaphragm;

said planar-magnetic transducer being operable as a single-ended planar-magnetic transducer.

39. A planar-magnetic transducer as set forth in claim 38, wherein the predetermined active region has a total surface area of less than 150 square inches, yet generates a high acoustic output having an upper audio bandwidth extending down to a low range audio frequency.

40. A planar-magnetic transducer as set forth in claim 38, further comprising a plurality of adjacently positioned high energy magnets having respective local loop energy maxima, wherein the majority of local loop energy maxima in the plane of the diaphragm have an average value which is greater

than an average value of energy levels at the central positions in the plane of the diaphragm between corresponding adjacent poles of the adjacent magnets.

41. A planar-magnetic transducer as set forth in claim 38, wherein the shared energy maxima is no greater than 90 percent of the local loop energy maxima.

42. A planar-magnetic transducer as set forth in claim 38, wherein the shared energy is no greater than 80 percent of the local loop energy.

43. A planar-magnetic transducer as set forth in claim 38, wherein the shared energy is no greater than 75 percent of the local loop energy maxima.

44. A planar-magnetic transducer as set forth in claim 38, wherein a predetermined distance between the local loop energy maxima for adjacent magnets is approximately equal to a separation distance between the corresponding adjacent magnets.

45. A planar-magnetic transducer as set forth in claim 44, wherein the predetermined distance between the local loop energy maxima for adjacent magnets is at least seventy five thousandths of an inch.

46. A planar-magnetic transducer as set forth in claim 45, wherein the predetermined distance between the local loop energy maxima is at least ninety thousandths of an inch.

47. A planar-magnetic transducer as set forth in claim 38 wherein the predetermined distance between the local loop energy maxima is at least 100 percent of the width of the magnets.

48. A planar-magnetic transducer as set forth in claim 38 wherein the predetermined spaced apart relationship between any two of the at least three adjacent, high energy magnets is at least seventy five thousandths of an inch.

49. A planar-magnetic transducer as set forth in claim 38 wherein the predetermined spaced apart relationship between any two of the at least three adjacent, high energy magnets is at least ninety thousandths of an inch.

50. A planar-magnetic transducer as set forth in claim 38 wherein the predetermined spaced apart relationship between at least two of the at least three adjacent, high energy magnets is at least one hundred and fifty thousandths of an inch.

51. A planar-magnetic transducer as set forth in claim 38 wherein the at least three adjacent, high energy magnets have common dimensions and the predetermined spaced-apart relationship between at least two of said adjacent magnets is at least one half the width of one of the adjacent magnets.

52. A planar-magnetic transducer as set forth in claim 38, wherein the predetermined spaced-apart relationship between at least two of the at least three adjacent, high-energy magnets is at least seventy percent of the width of one of said adjacent magnets.

53. A planar-magnetic transducer as set forth in claim 38 wherein the predetermined spaced-apart relationship between at least two of the at least three adjacent, high-energy magnets is at least 100 percent of the width of one of said adjacent magnets.

54. A planar-magnetic transducer as set forth in claim 38 wherein the high energy magnets are neodymium magnets with an energy rating of at least 34 mGO.

55. A substantially single-ended planar-magnetic transducer comprising:

a thin film, diaphragm having a first surface side and a second surface side and including a conductive surface area for converting an input electrical signal into a corresponding acoustic output, said at least one diaphragm including a predetermined active region;

a high energy magnetic structure having sufficient magnetic field strength and being configured with respect to the diaphragm to drive the diaphragm as a substantially single-ended audio transducer; and

mounting structure coupled to the diaphragm to hold the diaphragm in a predetermined state of tension and at a predetermined distancing from the high energy magnetic structure over an extended period of time including periods of use and nonuse;

said diaphragm having improved performance characteristics by using a polyethylenenaphthalate film as a base material for the diaphragm.

56. A planar-magnetic transducer as set forth in claim 55, further including a low mass high temperature polyurethane cross linked adhesive for bonding said conductive surface areas to the film diaphragm.

57. A planar-magnetic transducer comprising;

a thin film diaphragm having a front surface and a rear surface and including a conductive surface area bonded to the diaphragm by a low mass high temperature polyurethane cross linked adhesive for converting an input electrical signal into a corresponding acoustic output, said at least one diaphragm including a predetermined active region;

a high energy magnetic structure having sufficient magnetic field strength and being configured and positioned to drive the diaphragm as a single-ended audio transducer; and

mounting structure coupled to the diaphragm to hold the diaphragm in a predetermined state of tension and at a predetermined distance from the high energy magnetic structure.

58. A planar-magnetic transducer as set forth in claim 57 wherein the high energy magnetic structure comprises neodymium magnets with an energy rating of at least 34 mGO.

59. A planar-magnetic transducer comprising:

at least one thin film vibratable diaphragm with a first surface side and a second surface side, including a predetermined active region, said predetermined active region including a predetermined conductive surface area for converting an input electrical signal into a corresponding acoustic output;

primary magnetic structure including at least three elongated magnets placed adjacent and substantially parallel to each other with at least one of said magnets being of high energy with each having an energy product of greater than 25 mega Gauss Oersteds; and

a mounting support structure coupled to the primary magnetic structure and the diaphragm to capture the diaphragm, hold it in a predetermined state of tension and space it at predetermined distancing from the primary magnetic structure adjacent one surface side of the film diaphragm;

said conductive surface area including elongate conductive paths running substantially in parallel with said magnets;

any of the at least three adjacent magnets being oriented to be of opposite polarity orientation in relation to an adjacent magnet;

said primary magnetic structure having at least three adjacent rows of side by side magnets with at least an outer two rows of the at least three rows of magnets providing less magnetic field strength through the conductive surface area of the diaphragm than provided through the conductive surface areas of the diaphragm by a center row of the magnets;

said planar-magnetic transducer operating as a single-ended planar-magnetic transducer.

60. A planar-magnetic transducer as set forth in claim 59 including at least five adjacent rows of magnets with at least two outer rows of said five rows of magnets providing less magnetic field strength through the conductive surface area of the diaphragm than provided through the conductive surface area of the diaphragm by a center row of magnets.

61. A planar-magnetic transducer as set forth in claim 59 wherein the primary magnetic structure includes neodymium magnets with an energy rating of at least 34 mGO.

62. A planar-magnetic transducer as set forth in claim 59 wherein:

said diaphragm has a central region and lateral regions that are a distance away from said central region,

said primary magnetic structure has central region magnets and adjacent lateral magnets that are spaced away from said central region magnets,

the predetermined spaced apart relationship of the diaphragm from the magnets of the primary magnetic structure being greater at a central region of the diaphragm over at least one central magnet than at the lateral regions over at least one lateral magnet.

63. A method for maintaining calibration for operation of a single-ended planar-magnetic transducer which utilizes a thin film diaphragm with a first surface side and a second surface side that includes a conductive region which is positioned and spaced from a primary magnetic structure including high energy magnets of greater than 25 mGO, said calibration relating to i) proper spacing between the high energy magnets , ii) magnet to diaphragm spacing, and iii) proper tensioning levels for an ongoing predetermined diaphragm tension,

said method including the steps of:

a) cooperatively configuring a support structure and positioning the high energy magnets of the primary magnetic structure in a predetermined spaced apart relationship wherein the mounting support structure stabilizes the primary magnetic structure and concurrently resists high energy magnetic forces interacting between the high energy magnets so as not to interfere with the predetermined diaphragm tension; and,

b) attaching the diaphragm to the support structure so that the predetermined diaphragm tension is obtained over long-term use.

64. The method in claim 63 including the further step of:

c) placing an intermagnet spacer structure abutting between the adjacent magnets.

65. The method in claim 64 including the further step of:

d) attaching a rigid, acoustically transparent bracing structure over the second surface side of the diaphragm and to the mounting support structure for further stabilizing the predetermined diaphragm tension and for protecting the diaphragm.

66. The method in claim 65 including the further step of:

e) positioning the high energy magnets in a spaced apart relationship to provide a lower value for a shared magnetic energy maxima between two adjacent high energy magnets and in the plane of the diaphragm centered between the adjacent high energy magnets as compared to local loop magnetic energy maxima in the plane of the diaphragm associated with respective adjacent poles of the adjacent magnets.

67. A method for reducing distortion in a single-ended planar-magnetic transducer including a primary magnetic structure and a mounting support structure and a vibratable diaphragm including a peripheral boundary and conductive region with said peripheral boundary;

said method including the steps of:

i) attaching the vibratable diaphragm to the mounting support structure such that it is mounted at predetermined distancing from said primary magnetic structure and held in a state of predetermined tension,

ii) applying a long term viscous material along at least a portion of the periphery of the vibratable diaphragm.

68. The method of claim 67 wherein said viscous material is a solvent based polyurethane compound.

69. The method of claim 67 wherein said viscous material is applied to the diaphragm and the diaphragm is made of polyethylenenaphthalate film.

70. The method of claim 68 wherein said solvent based polyurethane viscous material is applied to the diaphragm and the diaphragm is made of polyethylenenaphthalate film.

71. A method for reducing distortion in a single-ended planar-magnetic transducer including a primary magnetic structure with multiple rows of magnets and a mounting support structure and a vibratable diaphragm including a peripheral boundary and conductive region within said peripheral boundary;

said method including the steps of;

i) attaching the vibratable diaphragm to the mounting support structure such that it is mounted at predetermined distancing from said primary magnetic structure and held in a state of predetermined tension,

ii) attaching at least one electrically conductive non-magnetic sheet structure with acoustically transparent areas such that said sheet structure has at least a surface area placed between at least two rows of said multiple rows of magnets to improve linearity of the magnetic field above the magnets.

72. The method of claim 71 wherein the electrically conductive sheet is made of copper.

73. A method to improve low frequency performance of a single-ended planar-magnetic transducer for the purpose of minimizing discontinuities and improving integration to a lower frequency speaker system,

said planar-magnetic transducer including a primary magnetic structure mounted to a support structure and a vibratable thin film diaphragm which includes an active region, a conductive area within the active region and conductive elements within the conductive area,

said thin film diaphragm being mounted to said mounting support structure and held in a predetermined state of tension and predetermined gap from said primary magnetic structure,

said method including the steps of;

i) including at least one elongated high energy neodymium magnet in said primary magnetic structure, and

ii) setting said predetermined gap to less than one millimeter.

74. The method of claim 73 wherein said predetermined gap is less than 0.75 millimeter.

75. The method of claim 73 wherein said predetermined gap is less than 0.5 millimeter.

76. The method of claim 73 wherein all magnets of said primary magnetic structure comprise neodymium magnets.

77. A method for increasing signal output capability of a single-ended planar-magnetic transducer having a fundamental resonant frequency and potential low frequency range down to frequencies below four hundred Hertz and a vibratable diaphragm area of less than one hundred and fifty square inches,

said planar-magnetic transducer including a primary magnetic structure mounted to a mounting support structure and a vibratable thin film diaphragm including a conductive region,

said thin film diaphragm mounted to said mounting support structure and held in a predetermined state of tension and predetermined gap from said primary magnetic structure,

said method including the steps of:

i) including high energy neodymium magnets in said primary magnetic structure, and

ii) adjusting said predetermined gap to less than one millimeter.

78. The method of claim 77wherein said diaphragm area is less than 100 square inches.

79. The method of claim 77 wherein said diaphragm area is less than 30 square inches.

80. The method of claim 77 wherein said low frequency range is less than eight hundred Hertz and said gap is less than 0.5 millimeters and diaphragm area is less than ten square inches.

81. A method for overcoming thermal limits of a thin film diaphragm and attached conductive elements while increasing sound pressure output capability of a single-ended planar-magnetic transducer ,

said planar-magnetic transducer including a vibratable thin film diaphragm including a conductive surface area and a multi magnet primary magnetic structure mounted to a mounting support structure,

said thin film diaphragm being mounted to said mounting support structure and being held in a predetermined state of tension and predetermined gap from said primary magnetic structure,

said method including the step of

including at least one elongated high energy neodymium magnet in said primary magnetic structure to reduce a required input power for a given sound pressure level and allowing increased sound pressure level before reaching the thermal limits.

82. The method of claim 81 including the further step of:

i) using polyethylenenaphthalate as the vibratable thin diaphragm to increase the thermal limits.

83. The method of claim 82 including the further step of;

ii) using a low mass high temperature polyurethane cross linked adhesive for bonding said conductive elements to the film diaphragm to increase the thermal limits.

84. A planar-magnetic transducer comprising:

at least one thin film vibratable diaphragm with a first surface side and a second surface side, including a predetermined active region, said predetermined active region including predetermined, elongate conductive surface areas formed of a plurality of conductive elements for converting an input electrical signal into a corresponding acoustic output;

a mounting support structure coupled to the primary magnetic structure and the diaphragm to capture the diaphragm, hold it in a predetermined state of tension and space it at predetermined distancing from the primary magnetic structure adjacent one of the surface sides of the film diaphragm; and

primary magnetic structure including at least three high energy, elongated magnets placed adjacent and substantially parallel to each other with each magnet having an energy product of greater than 25 mega Gauss Oersteds;

at least two of said high energy magnets being adjacently positioned in a predetermined spaced apart relationship wherein adjacent poles of the adjacent

magnets have nonshared, localized magnetic loops represented by local loop energy maxima as well as shared magnetic loops between the respective adjacent poles of the high energy magnets;

said conductive surface area running substantially parallel to said magnets and more proximate to the local loops of the high energy magnets than to a center point of the shared magnetic loops between the adjacent magnets;

said planar-magnetic transducer being operable as a single-ended planar-magnetic transducer.

85. A transducer as set forth in claim 84, wherein the conductive elements are substantially parallel to the elongated magnets and the conductive surface areas are most proximate to the respective local loop energy maxima associated with an adjacent magnet.

86. A planar-magnetic transducer as set forth in claim 84 wherein the high energy magnets are neodymium magnets with an energy rating of at least 34 mGO.

87. The transducer of claim 84, wherein the respective conductive surface areas are approximately centered over the local loops of adjacent high energy magnets.